

Why Do Patients With Cancer Visit Emergency Departments? Results of a 2008 Population Study in North Carolina

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Submitted December 14, 2010; accepted April 4, 2011; published online ahead of print at www.jco.org on May 23, 2011.

Supported by the North Carolina Translational and Clinical Sciences Institute (TraCS; Award No. 2KR30903) and Award No. UL1RR025747 from the University of North Carolina's National Institutes of Health Clinical and Translational Science National Center for Research Resources.

The content of this article does not necessarily represent the official views of the National Center for Research Resources or the National Institutes of Health.

Authors' disclosures of potential conflicts of interest and author contributions are found at the end of this article.

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0732-183X/11/2919-2683/\$20.00

DOI: 10.1200/JCO.2010.34.2816

ABSTRACT

Purpose

Emergency departments (EDs) in the United States are used by patients with cancer for disease or treatment-related problems and unrelated issues. The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) collects information about ED visits through a statewide database.

Patients and Methods

After approval by the institutional review board, 2008 NC DETECT ED visit data were acquired and cancer-related visits were identified. Descriptive statistics and logistic regressions were performed. Of 4,190,911 ED visits in 2008, there were 37,760 ED visits by 27,644 patients with cancer.

Results

Among patients, 77.2% had only one ED visit in 2008, the mean age was 64 years, and there were slightly more men than women. Among visits, the payor was Medicare for 52.4% and Medicaid for 12.1%. More than half the visits by patients with cancer occurred on weekends or evenings, and 44.9% occurred during normal hours. The top three chief complaints were related to pain, respiratory distress, and GI issues. Lung, breast, prostate, and colorectal cancers were identified in 26.9%, 6.3%, 6%, and 7.7% of visits, respectively, with diagnosis. A total of 63.2% of visits resulted in hospital admittance. When controlling for sex, age, time of day, day of week, insurance, and diagnosis position, patients with lung cancer were more likely to be admitted than patients with other types of cancer.

Conclusion

To the best of our knowledge, this is the first study to provide a population-based snapshot of ED visits by patients with cancer in North Carolina. Efforts that target clinical problems and specific populations may improve delivery of quality cancer care and avoid ED visits.

J Clin Oncol 29:2683-2688. © 2011 by American Society of Clinical Oncology

INTRODUCTION

The Institute of Medicine report on ensuring quality cancer care provided a review of cancer services and delivery systems and identified a "wide gulf between what could be construed as the ideal and the reality of their experience with cancer care."¹ One recommendation from the report was the need to conduct studies on why segments of the population do not receive appropriate cancer care. Visiting the emergency department (ED) may be considered appropriate care when assessing and managing acute onset problems but may also reflect problems not adequately addressed or managed during routine cancer care.² In addition, EDs are often overcrowded and are providing care to larger numbers of patients; this might not be the best environment for oncology patients with urgent care needs.³

There are few data available on ED use by oncology patients. Studies conducted to date focus on the experience of one institution or one population (eg, breast cancer or the elderly). Bozdemir et al⁴ studied all visits to the ED by patients with cancer at their institution in Turkey over a 6-month period. There were 324 visits from 245 patients with cancer; 37.3% were admitted to the hospital, and 38% had more than one visit. The most common presenting problems for these patients were pain (24%), shortness of breath (17%), nausea and vomiting (14%), fever (13%), and fatigue, diarrhea, and malaise (all less than 10%). Almost half of these patients (49.4%) died within 3 months of their ED visit. In a population study of deaths related to cancer in Ontario between 2002 and 2005, 83.8% of those who died had visited the ED during their final 6 months of life (76,759 of 91,561).⁵ The most common presenting problems for these patients were abdominal pain,

lung cancer, dyspnea, pneumonia, malaise and fatigue, chest pain, and pleural effusion. These studies suggest that ED visits are for complications of cancer or its treatment, other comorbidities, or symptoms near the end of life.⁶ Other studies^{7,8} have evaluated unplanned hospital readmissions. The purpose of this study, which used a statewide population-based data set, was to describe why patients with cancer use the ED and to identify which patients are admitted. These findings will help identify gaps in cancer care (eg, symptom management) and services.

PATIENTS AND METHODS

The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) system includes a mandated statewide population-based database of ED visits.⁹ These data are primarily collected as part of routine patient care and hospital administration and are made available to NC DETECT as secondary data for public health surveillance and research. NC DETECT performs extensive data quality assurance measures on these data,¹⁰⁻¹² including limited data validity audits. Although these secondary data are not perfect, they do allow us to look at health issues at the population level for the state. In 2008, data were received from 110 of 112 North Carolina acute care hospital-affiliated EDs. NC DETECT captured approximately 99.5% of all ED visits in North Carolina in 2008. After obtaining institutional review board exemption and securing a data use agreement, the 2008 NC DETECT ED data set with de-identified patient level data was obtained.

According to the Centers for Disease Control and Prevention, the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is the official system of assigning codes to diagnoses and procedures associated with hospital use (including the ED) in the United States. Hospital employees typically assign more than one ICD-9-CM code per visit. The ICD-9-CM code listed in diagnosis position one (ie, listed first) for a visit is considered the primary diagnosis, the ICD-9-CM code in diagnosis position two (ie, listed second) is considered the secondary diagnosis, and so forth. NC DETECT captures up to 11 diagnosis codes for each ED visit. For this study, ED visits were considered if they had any ICD-9-CM code related to a cancer diagnosis (Appendix Table A1, online only). However, only ED visits with a cancer-related ICD-9-CM code in diagnosis positions 1 to 5 were included in the main analyses. Visits with cancer-related ICD-9-CM code(s) in diagnosis position ≥ 6 were excluded from this analysis, because cancer did not appear to be an associated or causative factor for the ED visit. Further exclusion criteria included cancer-related ICD-9-CM V codes (ie, personal or family history of cancer) because V codes are not standardized across coders. In addition, when visits with only cancer-related ICD-9-CM V codes were compared with visits with cancer-related ICD-9-CM codes other than V codes, noticeable differences were found.

Patient and visit demographic variables for cancer-related visits from NC DETECT included patient sex, age at first visit (< 65 or ≥ 65 years), county of residence, frequency of visits, diagnosis position of cancer-related ICD-9-CM code, cancer type, disposition (admitted, discharged, died, or other), insurance (private, Medicare, Medicaid, other/unknown), visit within 7 days of previous visit, temperature, visit day and visit hour category (holiday and weekend: 6:00 PM Friday to 8:00 AM Monday; clinic off-hours: 6:00 PM to 8:00 AM Monday through Thursday; or regular clinic hours: 8:00 AM to 6:00 PM Monday through Friday), visit month, visit day of the week, and visit hour of the day. Descriptive statistics, both counts and percentages, were calculated for each of these variables.

Frequencies of categorized chief complaints (CCs) were also assessed. The CC is the stated reason for the ED visit captured when the patient arrived in the ED; it is typically recorded by a triage nurse or by clerical staff. There is no standard nomenclature or coding rule for ED CCs; they include free text entries as well as terms from local or vendor-developed pick lists.¹² Some CCs of patients with cancer include the term cancer and others focus only on the presenting symptom(s). Therefore, to clean and standardize CC fields, entries were processed through a text processor—

Table 1. Chief Complaints by Category

Chief Complaint Category	Raw Chief Complaints Included in Category
GI	Vomiting, nausea, diarrhea, constipation, bowel obstruction, anorexia, can't eat, won't eat, unable to eat
Pain	Chest pain, back pain, abdominal pain, pain, side pain, leg pain, hip pain, flank pain, groin pain, lower abdominal pain, shoulder pain, arm pain, foot pain
Neurologic	Altered mental status, seizure, altered level of consciousness, unresponsive, stroke, cerebrovascular accident, consciousness decreased, transient ischemic attack, hemiparesis, slurred speech, disoriented, brain tumor, change in mental status, loss of consciousness, change mental status, facial droop, confused
Malaise	Malaise, weak, weakness, general weakness, malaise and fatigue, fatigue, generalized weakness
Injury	Fall, fell, motor vehicle accident, motor vehicle crash, trauma, ankle injury, injury, fracture, dog bite, insect bite, bee sting, animal bite
Fever	Fever, febrile seizure, chills
Allergic reaction	Medication reaction, allergic reaction, hives
Bleeding	Bleeding, bleed, blood, nosebleed
Syncope	Syncope, dizzy, dizziness, fainting, faint
Blood clots	Deep vein thrombosis, blood clot, pulmonary embolus
Respiratory	Shortness of breath, trouble breathing, coughing, coughing up blood, pneumonia
Psychiatric	Depression, anxiety, suicidal
Cancer	Brain tumor, cancer patient, cancer, cancer complication, cancer + symptom (eg, "cancer, weakness" and "cancer, vomiting"), chemo, chemo + symptom (eg, "chemo, fever" and "chemo, dehydration")

Emergency Medical Text Processor (EMT-P).¹³ This previously validated natural language processing system corrects common misspellings, acronyms, and abbreviations and uses contextual features to standardize CC text from EDs.¹⁴ For this study, the investigators performed an additional step: after processing with EMT-P, we categorized CCs on the basis of a priori expectations for oncology patients (eg, pain or GI complaints) and by reviewing the processed CCs (Table 1). Because CC categories were not exhaustive nor were they completely inclusive, some CCs were left uncategorized. Therefore, counts and percentages for this variable are approximate.

In addition to descriptive statistics for the variables previously described, unconditional logistic regression was used to estimate odds ratios (ORs) and 95% CIs for being admitted to the hospital based on insurance coverage (Medicare v Medicaid v other), diagnosis position of cancer-related ICD-9-CM diagnosis code (positions 1 to 2 v positions 3 to 5), and cancer type (lung v other). OR models were adjusted for sex, age, and visit day/visit hour category, as well as insurance and cancer diagnosis position. Models were also adjusted for CC category.

RESULTS

In 2008, there were 4,190,911 visits to North Carolina EDs captured in NC DETECT, of which 37,760 (0.9%) were cancer-related visits by 27,644 patients with cancer. Of these patients, 306 (1.1%) were noted to have in situ cancer (eg, ductal carcinoma of the breast); they were included because they may have had cancer treatment leading to the ED visit. There were slightly more male patients with cancer (51.4%),

and ages ranged from 5 to older than 90 years with a mean age of 64.5 years (Appendix Table A2, online only). Of the visits, the most common diagnosis was lung (26.9%), followed by colorectal (7.7%), breast (6.3%), and prostate (6%) cancer; the other 53% were among all other types of cancer (Appendix Table A3, online only). Expected source of payment for the ED visit was the government (either Medicare or Medicaid) in 64.5% of visits, private insurers (24.3%), and self-pay or other (11.2%).¹⁵

ED visits were categorized by hour, day of the week, and month of the year (Fig 1). Variations by time of day ranged from the lowest number of visits in the early morning hours to peak number of visits in mid-afternoon. Variations by day of the week ranged from 13.4% to

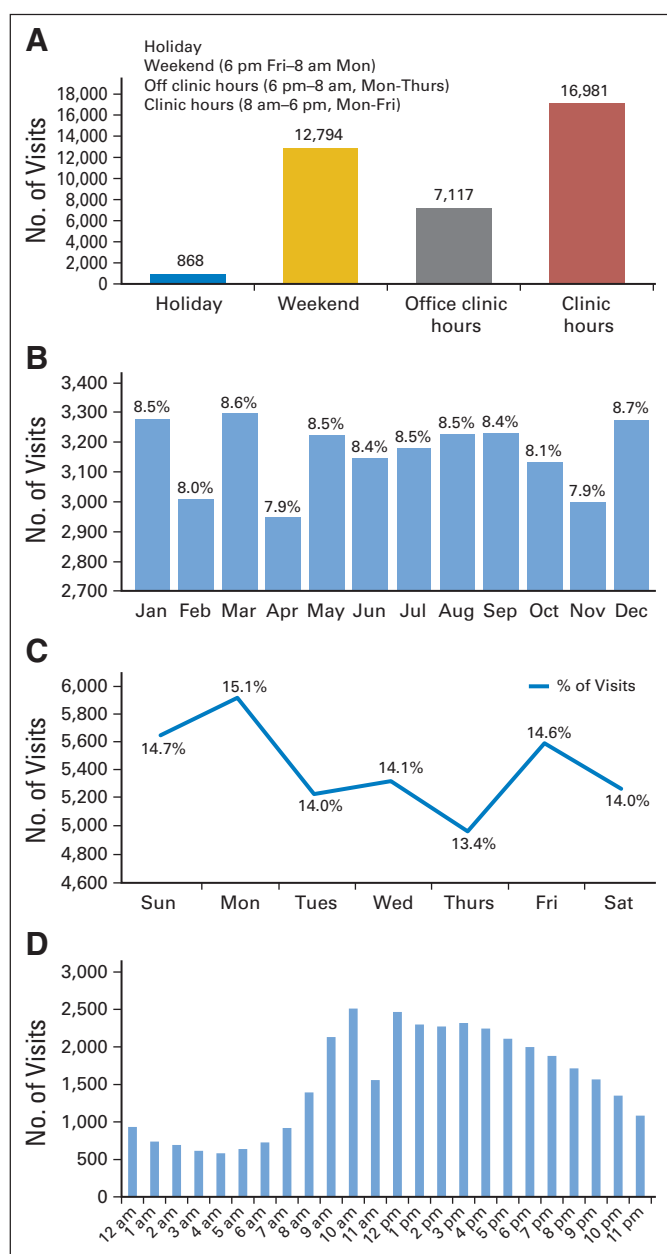


Fig 1. 2008 North Carolina (NC) emergency department (ED) visits by oncology patients, by (A) No. per type of clinic hours, (B) percentage per month, (C) percentage per day of the week, (D) No. per hour of day.

Table 2. 2008 NC DETECT Categorized Chief Complaints for Visits (N = 37,760)

Chief Complaint	No.	Overall Rank
Pain	9,000	1
Chest pain	2,429	
Abdominal pain	3,044	
Back pain	900	
Extremity	888	
Other	1,971	
Respiratory	5,856	2
Respiratory distress/SOB	4,711	
Cough	591	
Hemoptysis	120	
Fever/possible pneumonia	282	
COPD	137	
Other	229	
GI	3,280	3
Nausea/vomiting	2,543	
Diarrhea	568	
Constipation	187	
Bowel obstruction	55	
Other	243	
Malaise	2,577	4
Neurologic	2,218	5
Bleeding	2,164	6
Fever	2,000	7
Injury	1,930	8
Falls	1,262	
Lacerations	81	
Bites	38	
MVA	133	
Other	447	
Cancer	1,724	9
Syncope	1,071	10
Blood clots	115	11
Allergic reaction	111	12
Psychiatric	99	13

Abbreviations: COPD, chronic obstructive pulmonary disease; MVA, motor vehicle accident; NC DETECT, North Carolina Disease Event Tracking and Epidemiologic Collection Tool; SOB, shortness of breath.

15.1%; Monday was the day for the highest number of visits and Thursday was the day for the lowest number of visits. Monthly variations ranged from 7.9% to 8.7% with April and November having the lowest number of visits and December having the highest number. Many visits (44.9%) occurred during clinic hours during the work week, although 55.1% occurred on weekends or holidays. Although most patients visited the ED only once, 22.8% visited more than once during 2008.

CCs

CCs varied considerably among the 37,760 visits and were clustered under major categories (Table 2). The three most common categories were those related to pain (n = 9,000), respiratory problems (n = 5,856), and GI issues (n = 3,280). Interestingly, fever was ranked seventh (n = 2,000). Although 569 visits had a diagnosis of fever $\geq 38^{\circ}\text{C}$ documented as measured in the ED, a measured temperature was not captured in the data for 71.2% of ED visits. Injury was the eighth most common CC category, with the majority of injuries (1,262 of 1,930) related to falls. CCs by cancer type are presented in Table 3

Table 3. Chief Complaint by Cancer Type*

Chief Complaint Category	Lung (n = 9,297)		Breast (n = 2,103)		Colon (n = 2,597)		Prostate (n = 1,654)		All Other Cancers (n = 16,973)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pain	2,114	22.7	673	32	873	33.6	576	34.8	4,892	28.8
Respiratory	2,967	32	268	12.7	218	8.4	198	12	2,309	13.6
GI	727	7.8	263	12.5	386	14.9	118	7.1	1,832	10.8
Malaise	787	8.5	144	6.9	210	8.1	121	7.3	1,367	8.1
Neurologic	635	6.8	78	3.7	107	4.1	110	6.7	1,310	7.7
Bleeding	466	5	104	4.9	299	11.5	152	9.2	1,171	6.9
Fever	379	4.1	156	7.4	134	5.2	62	3.8	1,292	7.6
Injury	435	4.7	179	8.5	123	4.7	158	9.6	1,061	6.3
Syncope	265	2.9	69	3.3	77	3	74	4.5	596	3.5
Blood clots	36	0.4	10	0.5	8	0.3	4	0.2	57	0.3
Allergic reaction	16	0.2	19	0.9	6	0.2	6	0.4	64	0.4
Psychiatric	21	0.2	13	0.6	6	0.2	5	0.3	55	0.3
Cancer	449	4.8	127	6	150	5.8	70	4.2	967	5.7
Missing chief complaint	1,011		840		—		640		3,325	

*Not all individuals had a chief complaint recorded, and the chief complaint categories are approximate and not exhaustive because they are based on the text searches. Therefore, the chief complaints by cancer type are approximate.

and are approximate, given the number of visits with missing data. Respiratory problems were highest in patients with lung cancer but pain, respiratory, and GI problems were the three most common CCs across all cancers.

Visits

The majority of cancer-related visits (63.2%) resulted in hospitalization, and there were 283 deaths in the ED (Appendix Table A3). Given the high rate of admission to the hospital, a regression analysis was performed to identify patients more likely to be admitted. Controlling for sex, age, time of visit, insurance, and cancer diagnosis position when it was not the main position, patients with lung cancer were more likely to be admitted (OR, 1.46; 95% CI, 1.38 to 1.54) than were patients with cancer in the first or second diagnostic position (OR, 1.6; 95% CI, 1.6 to 1.53; Table 4). Of the 34.2% of ED visits that ended in discharge, 43% (n = 5,257) occurred during clinic hours.

Location

Geographic location for ED visits was mapped by county. The 2008 county cancer survivor prevalence rates (n = 358,283) were

obtained for each county from the North Carolina Central Cancer Registry, and the rate of visits was calculated on the basis of these data. In 2008, the median (and mean) visits were 11% of cancer survivors' visits to the ED in North Carolina, but the rate by county ranged from 3% to 29%; three of 100 counties had an ED visit rate of more than 22%, although 11 of 100 counties had rates less than 6%. We compared the ED rates with the prevalence rates for all cancers, for lung cancers, and for number of health care providers per population but did not find any association among them.

DISCUSSION

This study documented ED use by patients with cancer from a state-wide population-based data set. Of the 358,283 estimated cancer survivors living in North Carolina in 2008, 27,644 (7.7%) visited the ED 37,760 times (or 1.4 visits per person). The top three reasons (CCs) for these visits were related to pain, respiratory issues, and GI problems. A majority of these ED visits (62.3%) resulted in hospitalization, and having lung cancer significantly increased the odds for admission.

Table 4. 2008 NC DETECT Odds of Admission v Discharge Among Visits (N = 37,760) by Cancer Patients for Insurance, Cancer Diagnosis Position, and Cancer Type

Behavior	No. Admitted	No. Discharged	Crude OR	95% CI	Adjusted OR	95% CI*	Fully Adjusted OR	95% CI†
Insurance								
Medicare	12,207	5,318	1.51	1.44 to 1.58	1.11	1.04 to 1.17	1.0	1.02 to 1.17
Medicaid	2,335	1,768	0.87	0.81 to 0.93	1.04	0.96 to 1.12	1.10	1.00 to 1.20
Other	7,195	4,728	1.0		1.0		1.0	
Cancer diagnosis position								
1-2	13,401	5,986	1.52	1.45 to 1.58	1.60	1.53 to 1.67	1.69	1.59 to 1.78
3-5	9,245	6,255	1.0		1.0		1.0	
Cancer type								
Lung	6,898	2,568	1.65	1.57 to 1.74	1.46	1.38 to 1.54	1.17	1.10 to 1.25
All others	15,748	9,673	1.0		1.0		1.0	

Abbreviations: NC DETECT, North Carolina Disease Event Tracking and Epidemiologic Collection Tool; OR, odds ratio.

*ORs adjusted for sex, age, and visit day/hour category, as well as insurance and cancer diagnosis position when it was not the main position.

†ORs adjusted for sex, age, visit day/hour category, and chief complaint, as well as insurance and cancer diagnosis position when it was not the main position.

Clearly, many of these patients were sicker when compared with the admission rate for patients with other illnesses in all NC DETECT visits in 2008, which was 15.1%. Similarly, there were 116.8 million ED visits in the United States in 2007, and 12.5% of these patients were admitted.¹⁶ This percentage is similar to the 2007 North Carolina ED disposition with 12.4% being admitted.¹⁷

This is only the second study to characterize a population-based sample of patients with cancer who use the ED; the first explored near end-of-life visits to the ED in Ontario.⁵ NC DETECT provided a systematic and consistent method of capturing data on a large number of cancer-related ED visits (N = 37,760).

There were several limitations to using the NC DETECT database; all data are secondary data, that is, data collected for other purposes (clinical and administrative). NC DETECT does not allow the use of hospital and/or ED facility identifying information, so associations between county of residence, site of usual health care, and location of the ED were not possible. In addition, information was not available regarding whether the individuals were under clinical care for their cancer and, if so, where they were receiving that care at the time of the ED visit. Race and ethnicity data are not captured in NC DETECT, prohibiting analysis using those variables. Some visits that were cancer-related may have been missed, and some visits that were not cancer-related may have been included. However, this issue was examined through analyses of diagnosis positions 6 to 11 and V codes, and decisions were made to limit the sample to those with cancer in the 1 to 5 diagnosis positions and to not include cancer if it was listed only as a V code to narrow errors of inclusion and exclusion. It was possible to identify a patient who visited the same ED multiple times, but it was not possible to identify visits by the same patient to multiple EDs. There are limitations to using CC data because, unlike ICD-9-CM codes for ED diagnosis, there is no standard terminology or set of rules for coding these data for ED visits. There are limitations to our categorization of CCs. Although the EMT-P system has been validated for ED CCs, our categorization method was developed for this study. Categories were not exhaustive nor were CCs within a given category completely inclusive, leaving some CCs uncategorized.

Hospital admission rates varied in other studies, as did the reasons for admission. For example, Grant et al⁷ examined unscheduled readmissions of 1,351 patients with cancer and found fever, sepsis, uncontrolled pain, dehydration, pneumonia, neutropenia, and nausea or vomiting to be the major reasons. Older patients (≥ 65 years) were more likely to visit the ED when they experienced decreased physical functioning, had more comorbid conditions, and had greater symptom severity.^{7,18} Seo et al¹⁹ explored a database of 2,567 older people in North Carolina and found that a recent or intermediate history of cancer significantly increased the rate of hospital admission but not ED use. Those with cancer had an average of three comorbid conditions (hypertension, arthritis, or fractures, followed by diabetes and cardiovascular disease). The NC findings were similar to those of McKenzie et al,²⁰ in that 87.6% of unplanned visits to the ED resulted in hospitalization. However, the main reasons for admission at one particular hospital were somewhat different: nausea and vomiting, pain, fever, shortness of breath, and dehydration were ranked as the most common reasons.

Many of the ED visits in this and other studies appear to be related to poorly controlled symptoms, including pain, respiratory distress, and nausea or vomiting. Although pain is a common problem in patients with cancer, experiencing breakthrough pain

was associated with increased ED visits, hospitalizations, and physician visits.²¹ Dyspnea was the second most common reason for a North Carolina ED visit although it was the fourth most common reason for an ED visit at a large cancer hospital.²² This may reflect progressive disease and confers a poor prognosis.^{23,24} ED visits were also found to be more numerous in patients with clinician-rated moderate to severe pain, moderate fatigue, or a Karnofsky performance status of $\leq 80\%$.²⁵ Although some of these symptoms may signal an acute onset problem, it is also possible that they represent failure to adequately manage common problems experienced by this population during their regular cancer care and may lead to unnecessary ED visits and hospitalizations. In 2008, approximately 10% of hospital admissions for acute and chronic conditions were potentially preventable.²⁶

Although costs were not calculated for these visits, projections were made on the basis of data from the Medical Expenditure Panel Survey.²⁷ In 2007, there were 499,000 visits to EDs by people with cancer in the United States at a cost of \$777,240,000.²⁸ The average facility and separately billing doctor expense per ED visit was \$1,038. Conservatively, that would put the costs of the North Carolina 2008 ED visits at \$10,762,704, of which 12% (\$1,291,542) were out-of-pocket expenses. On the basis of these estimates, if it was possible for patients to be seen during clinic hours and discharged (presumably for symptom management), \$5,456,766 in ED separately billing doctor expenses would not have been incurred.

Many visits (44.9%) occurred during normal clinic hours; most of these patients (36.8%) were seen and discharged from the ED, but 8.1% were admitted. This raises the issue of whether patients could have been seen by their oncologist instead of going to the ED. It is possible that some of these patients may have visited local EDs because their regular oncology care was provided at a cancer center some distance from their home, but it was not possible to examine this issue by using NC DETECT. If health care services had been available, could those patients have avoided an ED visit? Were patients and families educated about when to go to the ED? Clinical oncology practices may want to review how they handle patients presenting with uncontrolled or escalating symptoms. Some settings are establishing urgent care or acute toxicity unit capabilities for oncology patients as a way to address this issue.²⁶ Others have established nursing interventions that have decreased ED use.²⁹ For those deemed sick enough for an admission, direct admission to the hospital might be more efficient and cost-effective when possible.

Although this study provides valuable information about ED visits in the oncology population, we need to learn more about these patients before and after these visits. Linking health care use data (from Surveillance, Epidemiology and End Result [SEER], Medicare, and Medicaid), we might be able to provide a more comprehensive view of precipitating events and sequelae after ED use. In doing so, we may be able to evaluate ED use as a potential quality indicator of care.

In conclusion, this study, to the best of our knowledge, is the first to provide a population-based snapshot of patients with cancer who go to the ED in North Carolina. More research is needed to explore this topic with individual patient data across care settings and over the course of a patient's illness. Efforts targeted at significant clinical problems (pain, respiratory distress, nausea and vomiting) and specific

cancer populations (eg, patients with lung cancer) have the potential to improve the delivery of quality cancer care and to potentially avoid some ED visits and hospitalizations.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The author(s) indicated no potential conflicts of interest.

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